

A. GLOSSARY

Associated Pressure Systems Equipment: Any pressurized component which is required for the use or operation of pressurized systems covered by these regulations.

Codes, Standards, and Guides: The reference to codes, standards, and guides within the text of this handbook includes national consensus codes, agency-wide and LaRC-wide standards which are required in design, inspection, certification, and operation of all pressure vessels and pressurized systems, both new and existing at LaRC. Codes, standards, and guides referred to in this document are available from the Recertification Team, Engineering Support and Facility Projects Branch, Facility Systems Engineering Division.

Contractor: Any company or organization who does work for or who supplies equipment to LaRC.

Designer: Anyone authorized by the government to perform work in accordance with standard engineering practices, codes, and LaRC safety regulations.

Deviation: The design, fabrication, inspection, or use of pressure vessels, piping, and associated equipment which is not in compliance with the codes, standards, and guides (defined above).

Equipment Operator: Anyone authorized by the government to operate, in normal use, the pressure vessels, pressure systems, piping, and associated equipment covered in these regulations. Operators must be qualified by appropriate training in the operational characteristics and procedures of the equipment system that they operate.

Fabricator, Installer: Anyone authorized by the government to perform work in accordance with standard trade practices, codes, LaRC specifications, and safety regulations.

Inspector: Anyone authorized by the government and/or authorized by LaRC to assure that fabricators and installers follow the scope and intent of the design specifications.

Pressure:

- **Design Pressure/Maximum Allowable Working Pressure:** This pressure shall be used in the design of a vessel for the purpose of determining the

minimum permissible thickness or physical characteristics of the different parts of the vessel. When applicable, static head shall be included in the design pressure to determine the thickness of any specific part of the vessel. The pressure relief devices shall be set to initially operate at a pressure not exceeding the maximum allowable working pressure of the vessel.

- **Operating Pressure:** This pressure is the operating pressure of the vessel system. For pressure vessels, it should be 5 to 10% less than the maximum allowable working pressure. This avoids relief device discharging at normal operating pressure due to the manufacturer's tolerance on set pressure and allows for resetting of a safety valve after relieving over pressure. For piping systems, the relief device shall be set in accordance with the appropriate piping code (ASME/ANSI B31.3, "Process Piping," or ASME/ANSI B31.1, "Power Piping").

Pressure Systems Committee (PSC): The PSC is one of the committees reporting to the ESB as set forth in LAPD 1150.2, "Boards, Panels, Committees, Councils, and Teams," Executive Safety Board. This committee conducts reviews and provides written approval or recommends for approval to the ESB deviations from code on pressurized systems/components; provides guidance and consulting service for safety and design of these systems; recommends, adopts, and/or interprets requirements of codes, standards, and design application for pressurized systems; and maintains an overview for developments in the field of pressure systems regarding new codes/modifications, new techniques, and improvements or applications thereof.

Radiographic Interpreter: An individual trained and qualified to the ASNT SNT-TC-1A Level-II position, certified by a LaRC individual that holds a current "ASNT Level-III certification."

Recertification: A verification of the pressure vessel/system suitability for continued safe service based on periodic inspection, testing, and analysis. (See LAPG 1710.42, "Safety Program for Maintenance of Ground-Based Pressure Vessels and Pressurized Systems" (Pending)).

Standard Practice Engineer(s) (SPE): The persons designated in LAPD 1150.2, "Boards, Panels, Committees, Councils, and Teams," Executive Safety Board, to review and approve the design and specifications of all pressurized ground and flight systems, and verify compliance with applicable codes, standards, and supplementary requirements of these regulations including granting of waivers of hydro test for repairs.

Office of Safety and Mission Assurance (OSMA): The LaRC organization that provides a point of contact between NASA Headquarters and other external organizations regarding safety matters per LAPD 1700.2, "Safety Assignments," participates in formulation and implementation of safety policy, ensures safety reviews of all systems, assures a testing and certification program for specialized

operators, and assists the Contracting Officer's Technical Representative in determining the adequacy of the contractor's safety programs.

Technical Project Engineer (TPE): The individual employed by the government and authorized by LaRC to supervise and coordinate the design of pressure vessels, pressure systems, piping, and/or associated equipment.

Temperature:

- **Maximum Design Temperature:** The maximum temperature used in the design of a vessel for the purpose of determining the minimum permissible thickness or physical characteristics of the different parts of the vessel.
- **Minimum Design Temperature:** The minimum temperature used in the design of a vessel for the purpose of determining the physical characteristics of the different parts of the vessel.

B. SPECIAL REQUIREMENTS AND EXCLUSIONS

B.1 SPECIAL REQUIREMENTS

B.1.1 Inspection/Recertification of Cryogenic Storage Vessels and Trailers

Cryogenic storage vessels and trailers at LaRC do not require periodic recertification but are to be visually inspected for frosting on the outer surface of the outer tank on a weekly basis. When frost is visually detected, appropriate measures must be taken to reestablish the proper annulus vacuum level. The annulus vacuum level is to be verified (500 microns or less) at least twice a year for cryogenic storage vessels and trailers that, by design, incorporate connections for annulus vacuum monitoring and pumping. Cryogenic storage vessels and trailers of this type are provided with redundant relief protection, that is, a rupture disc and relief valve. Recertification of relief valves is to follow the guidelines stated in NPG 1700.6A, "Guide for In-Service Inspection of Ground-Based Pressure Vessels and Systems." The inner tank rupture disc is to be replaced at the time of relief valve recertification.

B.1.2 Pneumatic Testing of Cryogenic Systems

Pneumatic testing of cryogenic systems in lieu of hydrostatic testing is permissible provided other approvals required by the regulation are met.

B.2 EXCLUSIONS

B.2.1 Portable Air Compressors

Portable air compressors designed to operate at 125 psig or lower are excluded from the requirements of this handbook. NPG 1700.6A is the basis for this exclusion.

B.2.2 Hydraulic Accumulator-Type Pressure Vessels

Individual variation in both vessel design and system installation needs to be considered. The pressure-volume relationship for gases that is described in NPG 1700.6A shall be used as a basis to exclude such accumulators from the requirements of this handbook, that is, the gas side pressure-volume multiple less than 5,000 psi-cubic feet (e.g., 500 psig x 10 cubic feet = 5,000). This basis shall be used for both new and existing systems at the service condition (combination) of maximum gas energy potential.

B.2.3 Hydraulic Components

Hydraulic components, covered by the National Fluid Power Association, are excluded from the requirements of this handbook. However, systems in which these components are used shall be reviewed by the Standard Practice Engineer.

B.2.4 Fire Extinguishers

These items are covered by Code of Federal Regulations Title 29 - Labor (CFR 29), Chapter XVII - OSHA PART 1910, Subpart L and include:

- Portable extinguishers,
- Stand pipe and hose systems,
- Automatic sprinkler systems,
- Fixed dry and wet chemical extinguishing systems,
- Carbon dioxide extinguishing systems, and
- Alternative gas (environmentally friendly) extinguishing systems.

B.2.5 Refrigeration Systems

Refrigeration systems are excluded from the requirements of this handbook. These systems are covered by the American Society of Heating, Refrigeration and Air Conditioning Engineers Regulations and Manufacturers' Specifications.

B.2.6 Over-the-Road Trailers

Over-the-road trailers with pressurized components are excluded from the requirements of this handbook. These trailers are covered by Department of Transportation regulations.

B.2.7 Water Systems

Water systems operating at pressures less than 100 psi and temperatures less than 212° F are excluded from the requirements of this handbook.

B.2.8 Pressurized Components

Pressurized components described in LAPG 1710.15, "Wind-Tunnel Model Systems Criteria," are excluded from the requirements of this handbook.

B.2.9 Utilities

Many pressure vessels and systems in use at LaRC fall into a utility category and present minimum potential hazard. Typically, these are pressure vessels/systems (i.e., water heaters, space heaters, or similar general utility services) that meet the guidelines established in NPG 1700.6A, "Guide for Inservice Inspection of Ground-Based Pressure Vessels and Systems."

B.2.10 AIR-PAK Rescue Equipment or other Self-Sustaining Breathing Apparatuses

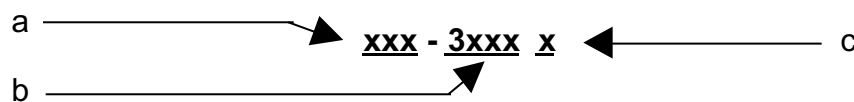
The items are covered by 29 CFR, Chapter XVII-OSHA Part 1910, Subpart I, Sections 1910.134 through 1910.140.

C. VALVE NUMBERING SYSTEM

C.1 VALVE NUMBERS

C.1.1 Numbering System

A standard valve numbering system for all LaRC facilities has been instituted that is compatible with the computer-aided maintenance system and eliminates number duplications. This system is based upon the use of seven (7) digits plus one suffix. A complete number, as it appears on a valve tag, is as follows:



- The first three digits identify the building in which the valve is located. These buildings are identified in Table C-1.
- The next four digits identify the particular device number. The valve in the example above is in the 3000 series.
- The suffix identifies the type of system in which the device is located. They are:

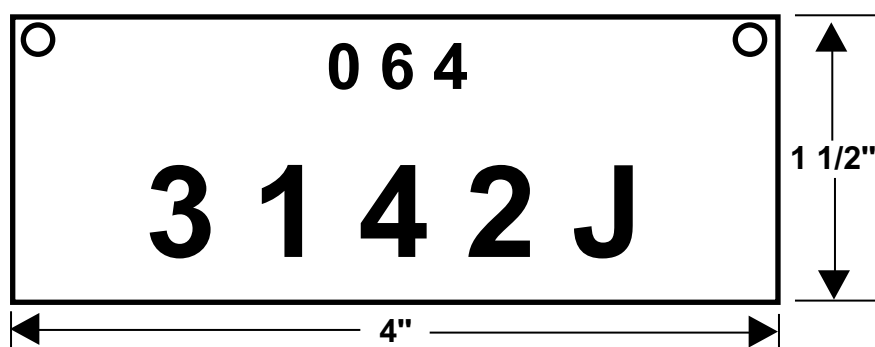
<u>SUFFIX</u>	<u>SYSTEM</u>
A, B, C, D & E	Air
F	Fuel (except Hydrogen)
H	Hydrogen
J & K	Helium
N & M	Nitrogen
P	Hydraulic Fluid
Q	Lubricating Oil
R	Other Inert Material
S & T	Steam and Condensate
U & W	Water
V	Vacuum
X	Oxygen, Oxidizers
Y	Freon
Z	Fluid Combinations

Thus, a typical valve number would appear as 064-3142 J, which would identify the device as being number 3142 in the helium system in Building 1247B.

The letter "Z" designates that more than a single fluid can be transported through the piping system. Anyone performing maintenance on a valve with this suffix, or disassembly of a system identified by this suffix, should be immediately alerted to the requirement to positively identify the system's media before maintenance or disassembly begins.

C.1.2 Tags

Tags applied to each device would appear similar to the following illustration:



For operating procedures, it would be sufficient to refer to the device as "thirty-one forty-two jay" - the building identifier being necessary only for maintenance services.

C.2 IMPLEMENTING THE VALVE NUMBERING SYSTEM

The identification system will be used on all valves and valve-type devices (that is, regulators). To avoid operational confusion during the transition phase and to assure minimum impact, the following ground rules apply:

- a. Where possible, suffix letters providing a generic tie-in will be given priority when assigning numbers to valves in the basic operating control loop of a particular system. These will be the valves normally appearing in a single standard procedure.
- b. In building complexes where several sets of research apparatuses (tunnel test sections) are serviced by a common distribution or vacuum systems, no two valves will be assigned the identical number. In other words, the distribution/evacuation system operating procedure would have no nomenclature ambiguities (same number and suffix with only differing identifiers).
- c. To minimize the impact of identification change, all valves, associated components, and particularly graphic panel identifications will bear both the old and new numbers until procedures have been demonstrated and operators are familiar with the new nomenclature. This will also provide adequate lead time for procurement of new name plates and tags.
- d. A cross-index of old and new device numbers will be made a part of facilities baseline documentation. This will enable the update of missing drawings,

possibly located as a result of some future drawing file purge, and will serve as a historical record. The cross-index may assume the form of a drawing.

- e. For new facilities, or the addition or modification to existing facilities, engineering design personnel should estimate the total valve numbers required, then request a block of numbers from the cognizant Facility Safety Head (or the Facility Safety Head's Facility Coordinator).

Table C-1, Building Identifiers for Equipment Maintenance Numbers.

<u>Building Number</u>	<u>Identifier</u>	<u>Building Number</u>	<u>Identifier</u>
581	1	1164	118
582	2	1165	143
582A	3	1166	162
583	4	1167	163
583A	5	1168	128
584	8	1169	132
585	3	1170	133
640	9	1171	134
641	10	1172	135
642	21	1173	136
643	11	1174	182
644	15	1175	166
645	14	1176	177
646	13	1177	178
647	12	1181	180
648	19	1183	175
650	20	1186	176
720	18	1187	181
720A & B	18	1188	173
1120	149	1189	174
1121	184	1190	170
1122	179	1191	172
1130T	107	1192	52
1133	156	1192A,B,C,D & E	52
1145	167	1194	30
1146	22	1195A & B	33
1147	82	1196	185
1148	23	1197	168
1149	24	1198	160
1151	35	1199	85
1152	26	1200	74
1153	79	1201	39
1154	83	1202	75
1155	78	1203	120
1156	112	1204	102
1157	113	1205	76
1158	114	1206	81
1159	115	1207	69
1160	116	1208	97
1161	117	1209	125
1162	140	1211	155
1163	25	1212	43

Table C-1, Building Identifiers for Equipment Maintenance Numbers (Continued).

<u>Building Number</u>	<u>Identifier</u>	<u>Building Number</u>	<u>Identifier</u>
1212B & C	43	1247D & G	66
1213	42	1247E	67
1214	165	1248	80
1215	41	1249	57
1216	169	1250	77
1218	36	1251	50
1218A	36	1251A	150
1219	37	1252	92
1220	49	1253A	89
1221	40	1254	158
1221A,B,C,D & E	40	1255	137
1222	54	1256	63
1223	29	1257	51
1223A	123	1258	51
1224T	171	1259	51
1225	44	1260	51
1227	86	1261	124
1228	56	1262	68
1229	45	1263	48
1229A	45	1264	151
1230	47	1256A-E	28
1230A & B	47	1266	90
1231	46	1266F	100
1232	55	1267	31
1232A	53	1267A & B	31
1233	34	1268A & B	70
1234	22	1270A & B	103
1235	58	1271	104
1236	59	1272	105
1237A,B & C	93	1273	106
1238A & B	27	1273A	106
1239	87	1274	69
1240	81	1274B	69
1241	61	1275	69
1242	122	1276	183
1243	88	1277	145
1244	60	1278	107
1244A,B,C & D	60	1279	107
1245	81	1281	107
1246	81	1283	108
1247B & H	64	1283A	108
1247A, C & F	65	1284A & B	109

Table C-1, Building Identifiers for Equipment Maintenance Numbers (Continued).

<u>Building Number</u>	<u>Identifier</u>
1284C	119
1285	139
1286	110
1287	126
1288	142
1289	96
1290	84
1291	95
1292	38
1293A & B	62
1294	111
1295A-D	250
1296	31
1297A & B	71
1298	72
1299	73
1299A-E	73

<u>Building Number</u>	<u>Identifier</u>
1300	130
1310	129
1312	91
Forklifts	94
Slings	98
Lifting Devices	99
Emergency Lights	101
Link Boxes (GW)	141
Outside Light (Poles)	144
Relays	146
Fire Alarm System	147
Sprinkler System	148
Tube-Type Trailers	152
Fire Hydrants	154
Fuel Tanks	159
Domestic Water Valves	164

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